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INTERNATIONAL MEETINGS OF ASTRONOMERS
IN GERMANY.

BY W. W. CAMPBELL.

It was my duty and pleasure to attend the meetings of the International Solar Union at Bonn, from July 30th to August 5th, inclusive, and the meetings of the Astronomische Gesellschaft at Hamburg, from August 6th to 9th, inclusive. The incidents of the meetings divide naturally into two classes: those relating to the hospitalities extended to the members of the Solar Union and of the Gesellschaft, and those relating to the scientific proceedings. The formal meetings gave consideration to many interesting and important questions, but the hospitalities enjoyed were indeed remarkable in number, perfection of arrangements, and suitability. The personal side may well be referred to first.

The members of the Solar Union and their friends came together for the first time at a reception and banquet extended by the City of Bonn, on Wednesday evening, July 30th, in the large hall of the Lese-und Erholungs-Gesellschaft, on the shore of the River Rhine. Greetings of welcome were extended by His Excellency, the Bürgermeister of Bonn, and appropriate addresses were also made by the Rector Magnificus of the University of Bonn, and others.

The members of the Union and their friends were received in the garden of the historic Bonn Observatory by Director and Frau KÜSTNER on Friday evening. An opportunity was at the same time afforded to inspect the instruments and current work of the observatory. The astronomers, recalling the exceeding fruitfulness of the Bonner Sternwarte under ARGELANDER, SCHÖNFELD, and KÜSTNER, felt that they were upon hallowed ground. The reception will be remembered as a perfect and charming event.

We were the guests of the city of Cologne on the afternoon and evening of Saturday, August 2d. There were opportunities to see the cathedral very completely, including the great collection of treasures, the Rhine bridge, and the picture gallery. A magnificent banquet was tendered in the hall of the

Gürzenich, within the Rathaus. This was presided over by His Excellency, the Bürgermeister of Cologne.

Two excursions were arranged for Sunday, August 3d: first, an automobile excursion across country, in cars provided by citizens of Bonn, via the interesting volcanic regions lying northwesterly from Coblenz, and on to the city of Cochem in the Mosel Valley, where luncheon was served; thence down the Mosel Valley to its junction with the Rhine at Coblenz, and along the left bank of the Rhine to Bonn; and secondly, for those who preferred, a walking tour through The Sieben Gebirge. My choice fell with the motor excursion. Again, the detailed plans of the long trip, covering approximately 200 kilometers, were arranged and executed with German thoroughness; the roads were perfect; the views were such as only those who have motored in the Mosel and Rhine valleys can adequately realize, and the events made up a red-letter day. The pedestrians were likewise enthusiastic.

The crowning social event of the meetings was Professor KAYSER's excursion on the Rhine, from Bonn southward nearly to Coblenz and return, between the hours of four and ten Tuesday evening, August 5th. The spirit of KAYSER had pervaded the Bonn meetings, and all members who could possibly remain in Bonn until Tuesday night stayed over to accept his hospitality. The large passenger boat, which the host had provided for the occasion, and the beautiful valley of the Rhine provided a perfect setting for the memorable events of the evening. The members of the Union had lived an exceedingly strenuous life for six days, and now that the work was done, all were ready to enjoy the views, embracing picturesque villages, the Rhine terraces, and the ruined castles, which were always in sight; and the banquet, accompanied by speeches in all the languages represented and by songs in many of the languages, found everybody entering into the spirit of the occasion.

The members were daily indebted to Professors KAYSER, KÜSTNER, PFLÜGER, and EVERSHEIM, and to their assistants, for countless thoughtful acts relating to the success of the scientific meetings and to the comforts and pleasures of the daily life. In response to the request of Professor PFLÜGER, the War Department of the German Government kindly ar-

ranged for an exhibition flight of a Zeppelin dirigible airship. The first session had just begun when a whirring noise attracted the attention of all, and a recess was taken in order that the delegates might observe the evolutions of the dirigible. The ship passed several times directly over the place of meeting and the exhibition was most impressive and greatly enjoyed.

The scientific meetings were held amid perfect surroundings in the rooms of the Physikalisches Institut of the university. The building had been completed and occupied only a few weeks prior to the meetings, and it includes what is probably the most up-to-date physical laboratory in the world.

The proceedings consisted almost wholly of the reports of the various committees and of discussions on the questions considered in the reports. On this occasion, as at former meetings, only a few of the reports were in printed form ready for distribution to the members, and as the reports relate largely to the technicalities of the subjects, it is not desirable to attempt here a comprehensive review of the proceedings. A feeling has existed that these reports should be completed, as nearly as possible, in advance of the meetings by correspondence methods, and that less should remain to be done when the committees come together at the stated meeting of the Union. Resolutions dealing with this phase of the subject were adopted, and it is hoped that the committee reports on future occasions may take final form at the first session of each committee, and be printed before formal presentation to the Union is made.

The Committee on Wave-Length Determinations was able to report extensive progress in the three-year interval since the preceding meeting of the Union. In this connection, we may mention Dr. BURNS'S determination of standard wave-lengths in the visual region of the spectrum by means of the interferometer, under the guidance of Professors FABRY and BUISSON at Marseilles, and to his accurate determinations of wave-lengths for some 4,000 lines in the spectrum of iron by means of a grating spectrograph, under the supervision of Professor KAYSER at Bonn; and, further, the discovery by Dr. GOOS of Hamburg that the wave-lengths in the arc spectrum vary markedly, depending upon the part of the arc which serves as the source of light. On account of the Goos phenomenon, the committee recommended and the Union decided that

in the determination of standard wave-lengths a direct current of 220 volts should be used in strength six amperes for lines whose wave-lengths are greater than 4,000 Ångströms, in strength four amperes for lines whose wave-lengths are smaller than 4,000 Ångströms, and that the slit of the spectrographs should receive light only from a central section, two millimeters long, of an arc whose poles are separated by an interval of six millimeters, with iron electrodes 7^{mm} in diameter.

The Eclipse Committee reviewed the results of observations at the three unfavorable eclipses of the past three years, and offered information of value to intending observers of the total solar eclipse which will occur in Norway, Sweden, and Russia on the afternoon of August 21, 1914. About twenty institutions had already signified their intention of dispatching expeditions to various points on the path of totality. M. DONITCH, of the St. Petersburg Academy of Sciences, has assumed the task of supplying intending observers with more detailed information concerning conditions along the eclipse path, and of advising as to the choice of observing stations, in order that parties may be well distributed to guard against a total failure from local clouds.

At the 1910 meeting, the Committee on the Classification of Stellar Spectra was appointed, with principal duty to consider and report upon the adoption of a system of stellar classification which should be suitable for universal use. The committee reported, and the Union adopted these two resolutions:

That the Committee on the Classification of Stellar Spectra be asked to secure by co-operation the material necessary for the establishment of a system that can be recommended for permanent and universal adoption; and

That pending the establishment of such a system the use of the Draper Classification be recommended in the form described in Volume 56, page 66, of the *Annals of the Harvard College Observatory*; except that hereafter in accurate classification, a zero be added to letters not followed by other numerals, and that the absence of any numeral be taken to indicate only a rough classification.

To illustrate: In the so-called helium group, if the spectra concerned can be assigned definitely to their places, the letter B will be followed by the corresponding number, as in B₀, B₁, B₂, . . . B₉, but if the assignment is not definite, the approx-

imate classification will be indicated by the letter B without accompanying numeral.

The Committee on Solar Rotation recognized that the differences in the results secured at Mount Wilson, Ottawa, and elsewhere, as yet unexplained, should receive consideration in the plans for further observations, and programs of observation having this end in view were recommended and adopted.

The report of the Committee on Solar Radiation was based largely upon the work of the Smithsonian Institution observers. Director ABBOT presented briefly the evidence which had led him to accept the conclusion that our Sun varies in radiating power as much as eight per cent in the course of a few days. He has further concluded that the output of solar energy increases slightly as the sun-spot areas increase, and *vice versa*; calling attention, however, to the apparent fact that temperatures at the Earth's surface decrease slightly with increasing sun-spot areas. The casual reader might conclude that these results are antagonistic, but this is not necessarily the case, for increased solar radiation may mean increased cloudiness in the Earth's atmosphere, with consequent reduction of mean temperatures at the Earth's crust. The subject is difficult as well as interesting, and I believe that ABBOT recognizes the need for further observation and investigation.

Interesting reports were presented by the Committees on Solar Prominences and on the Spectroheliograph. A new committee was organized to deal with all visual observations of the phenomena of the Sun's atmosphere.

About ninety astronomers and physicists attended the Bonn meetings. Of these, thirty were from German institutions and sixty were from other countries. America had the honor of providing the largest foreign attendance, as follows: ABBOT, Smithsonian Institution; Miss ALLEN and Miss WHITING, Wellesley College; AMES, Johns Hopkins University; CAMPDELL, and BURNS, Lick Observatory; E. C. PICKERING, Miss CANNON, and BAILEY, Harvard College Observatory; NICHOLS, Cornell University; PARKHURST and SLOCUM, Yerkes Observatory; PLASKETT, Ottawa Observatory; RUSSELL and SHAPLEY, Princeton University; SCHLESINGER, Allegheny Observatory; ST. JOHN, Mt. Wilson Solar Observatory; DOOLITTLE, SR., Flower Observatory; and STEBBINS, University of Illinois.

The next meeting of the Union will occur in Rome within the year 1916, probably in one of the spring months.

Nearly all the foreign astronomers at Bonn went to Hamburg to attend the twenty-fourth meeting of the *Astronomische Gesellschaft*. The attendance numbered about one hundred and fifty members—by far the largest in the history of the *Gesellschaft*. This was due to three principal facts:

1. Hamburg was selected as the place of meeting in order that members should have the opportunity of inspecting the recently completed Hamburg Observatory.
2. The time of the meeting was set to follow immediately that of the Solar Union meetings at Bonn.
3. The *Gesellschaft* was celebrating the completion of its first half-century of existence.

In Hamburg, as at Bonn, the importance of the personal element in astronomical progress was recognized. The *Gesellschaft* is fundamentally a co-operative organization, as it was founded, fifty years ago, with principal purposes to care for the asteroids whose discoveries were coming rapidly, for the undertaking of accurate meridian-circle observations of the stars down to slightly fainter than the ninth magnitude in zones assigned to various co-operating observatories, and to other similar purposes.

The city of Hamburg is a strong patron of the arts and sciences, and the hospitality extended to the visitors was exceedingly generous, appropriate, and well arranged.

The afternoon of Wednesday, August 6th, was devoted to the "Hamburger Sternwarte in Bergedorf." A special train carried the astronomers and friends southeasterly about fifteen miles to the village of Bergedorf, where the government of Hamburg, assisted by much private generosity, has built one of the most extensively equipped observatories in the world. The institution is located on the top of a ridge perhaps two hundred feet above the surrounding low-lying country. After luncheon in a large tent on the observatory grounds, several hours were devoted profitably to inspecting the large refractors, the large reflectors, the meridian instruments, and much auxiliary equipment. The domes, buildings, and instruments are all of the highest quality of modern German construction. A special article would be needed to do justice to the subject,

and accordingly no description is attempted here. It is understood that the Hamburg government has undertaken to support its observatory on a generous basis; and a large staff of astronomers and assistants is already at work. The enthusiastic director, Professor Dr. SCHORR, has assumed a great responsibility, and in this he had the best wishes of all his guests of the day.

The educational department of Hamburg gave to the visitors on Thursday evening a splendid banquet, presided over by Senator Dr. von MELLE.

The whole of Friday was devoted to an inspection of the Hamburg harbor, thanks to the generosity of the Hamburg-Amerika Linie. The visitors, divided into two parties, steamed through the principal ramifications of the harbor, and were deeply impressed by the extensiveness of the harbor, the number of ships in action, the modern equipment for handling cargo, and the building of new ships of largest size. Lunches were served on the ocean-going steamers "Blücher" and "Tabora."

Especially memorable was the private hospitality enjoyed on Saturday evening by many of the older astronomers, in the home of the Hamburg gentleman who has provided so many observatories with instruments of the highest precision.

The scientific sessions were opened by an address of welcome from Senator von MELLE, as a representative of the Senate of the Hamburg government. Professor SEELIGER, as President of the Gesellschaft, replied happily, with many references to the history of the Gesellschaft. He called attention to the interesting fact that whereas the Gesellschaft at its founding, half a century ago, was largely an organization of German astronomers, 56 per cent of the 426 members at the present time live outside of Germany.

Of the two astronomers who, as young men, had been chiefly instrumental in the founding of the Gesellschaft, one, Professor FÖRSTER, was present, in his eighty-first year, and the other, Professor AUWERS, was greeted in Berlin by a congratulatory telegram from Hamburg.

The four scientific sessions were concerned chiefly with the reports of committees in charge of the various departments of astronomical research fostered by the Gesellschaft.

By far the most extensive duty assumed by the Gesellschaft had been that of forming the Gesellschaft zones of accurate star positions. This work is now complete from the southern limit of the north polar region covered by CARRINGTON's catalogue of star places, southerly to declination -18° . The zone comprised from between -18° to -23° , assumed by Algiers Observatory, is so nearly finished that the Gesellschaft announced the probable receipt of the results in manuscript within a few days. The Córdoba Observatory had undertaken the extension of the Gesellschaft zones southward to declination -37° . It was announced, on the basis of Director PERRINE's communication, that Part I of the extension, embracing -22° to -27° , was complete, and that Parts II and III, from -27° to -37° , would be ready for the printer in 1914. It is the plan that the sky from -37° to the south pole shall be observed by photographic methods, rather than that individual meridian-circle determinations of star places shall be made. This seems to be a good place to report the existence of a strong feeling on the part of many astronomers present in Hamburg that the accurate positions of stars fainter than the eighth visual magnitude should in future be determined by photographic means, and that future work with meridian instruments should be confined to stars brighter than the eighth visual magnitude, especially with a view to obtaining extremely accurate positions of the brighter stars to assist in forming satisfactory systems of reference for the photographically observed fainter stars.

Reports upon the state of knowledge concerning variable stars and comets were presented. Other reports related to the publications *Der Astronomische Jahresbericht* and *Die Astronomische Nachrichten*, to investigations of asteroid orbits, and to plans for stellar parallax determinations from observations with meridian instruments. Reporting on the last-mentioned subject, GROSSMANN stated that his observations of *Arcturus* yield a parallax of $0''.2$,—in striking contrast with heliometer results approximating $0''.07$. A few members urged that extensive meridian observations for parallax should be carried on, but others felt equally certain that it would be unwise to devote any considerable fraction of astronomical research to this method of investigation at the present time,

as the accidental and systematic errors seem entirely too large to give reasonable confidence in the results.

After the completion of reports on the stated subjects, there was opportunity for the presentation of fifteen or twenty short papers dealing with individual researches. In this connection, it might be said that several foreign members had held the erroneous view that there would be no opportunity for the presentation of individual papers, but that it was the custom to limit the scientific proceedings to the reports of the various committees and to the discussion of these reports. We take space for reference to three or four papers.

CHARLIER discussed the systematic proper-motions of the brighter stars. He was led to the conclusion that KAPTEYN's theory of two star-drifts is not satisfactory, but that SCHWARZSCHILD's ellipsoidal hypothesis of stellar preferential motions possesses a much higher degree of probability.

SEELIGER presented a paper on the fundamental conceptions of motion, space, and time, which would be equally appropriate in gatherings of astronomers and of philosophers. To mention only one of his conclusions, he expressed the view that, of the various geometrical conceptions existent, only the Euclidean system was applicable to astronomical problems.

BAILEY, of Harvard, read an interesting paper on the variable stars known as cluster variables—a subject to which his contributions have been so extensive that the subject may be said to be almost exclusively his own.

WOLF, of Heidelberg, showed many beautiful photographic spectra of nebulae and of several especially interesting stars.

What was to me the most interesting paper was read by ROSENBERG, of Tübingen, on the application of the photo-electric cell to the photometry of variable stars. During many preceding months, astronomers were considering the work of KOCH on laboratory applications of the photo-electric cell as indicative of its great promise in stellar photometry. Consequently, we were prepared to learn from ROSENBERG's paper that the electric-cell photometer surpasses all other forms of existing photometers many-fold in sensitiveness. With this photometer attached to a five or six-inch refracting telescope, he was able to secure brightness measures of a star between the fifth and sixth visual magnitudes, in two minutes, with

the probable error of a single determination not exceeding 0.002 magnitude. STEBBINS commented in generous spirit upon ROSENBERG's results by saying that the best he had been able to do with his selenium photometer, attached to a 12-inch telescope, was to secure the measure of brightness of a second-magnitude star, in one hour, with probable error 0.01 magnitude. Professor STRUVE commented that GUTHNICK, an assistant in the Berlin Observatory, was likewise applying one of the electric-cell photometers to the study of variable stars, and had met with considerable success. Granted that the accuracy claimed for this new form of photometer is approximately correct, it must be apparent to all students of variable stars that we are about to enter an exceedingly rich field of astronomical investigation; in fact, it requires no unusual stretch of imagination to foresee that this photometer may be as powerful a tool in the hands of astronomers as the spectroscope and photographic plate have been.

Although it is the policy of the Gesellschaft to hold meetings only every other year, on the average, it was decided that the twenty-fifth meeting should occur at St. Petersburg and the Pulkowa Observatory shortly following the total solar eclipse of August 21, 1914, which event will call many astronomers from many countries to Russia.

A large number of the astronomers and friends, especially of the foreign contingent, spent a delightful and profitable day, August 11th, at the Potsdam Observatory, as the guests of Director and Frau SCHWARZSCHILD. The Potsdam astronomers have always been prominent in the advance guard of investigators, and the administration of the second director promises to be as fruitful of results as was that of the first. The current researches of the observatory were illustrated extensively by means of photographs.

An event of unusual importance relates to the removal of the Berlin Observatory from the center of the city of Berlin to the summit of a low hill in the village of Neubabelsberg. The new location is about four miles from the Potsdam Observatory, on the side toward Berlin. Director STRUVE was able to dispose of the old site for a large sum of money, and a part of the funds thus made available is providing the new observatory with a greatly enlarged and splendid equipment.

There is a large central building, to contain a refracting telescope of about 26-inch aperture, other smaller telescopes, library and working-rooms, offices and computing rooms, accompanied by other buildings to contain meridian instruments and a reflecting telescope of diameter between 40 and 50 inches. Excellent progress has been made with the buildings and instruments; the staff of astronomers and assistants has been greatly increased; and this institution should be one of the most fruitful of observatories. A small refractor, moved from the old observatory, is already securing notable results by virtue of a photo-electric cell photometer attached to its eye end. At the close of the Potsdam visit many astronomers went to Neubabelsberg and were most favorably impressed by what they saw.

I sailed homeward on August 12th, with the knowledge that German astronomy is as wide awake as German commerce and German education.

PLANETARY PHENOMENA FOR NOVEMBER AND DECEMBER, 1913.

BY MALCOLM MCNEILL.

PHASES OF THE MOON, PACIFIC TIME.

First Quarter Nov. 5, 10 ^h 34 ^m A.M.	First Quarter..Dec. 5, 6 ^h 59 ^m A.M.
Full Moon .. " 13, 3 11 P.M.	Full Moon " 13, 7 0 A.M.
Last Quarter.. " 20, 11 56 P.M.	Last Quarter . " 20, 8 16 A.M.
New Moon .. " 27, 5 41 P.M.	New Moon ... " 27, 6 59 A.M.

The Sun reaches the winster solstice, the point farthest south from the equator, on December 22d, about 3 A. M. Pacific time.

Mercury is an evening star on November 1st, reaching greatest east elongation on that date. The elongation is an average one, 23° 34', but other things conspire to make conditions for visibility very poor, and the planet sets less than an hour after sunset, making it practically impossible for naked-eye view. Eastern elongation in the autumn generally afford a poor opportunity for visibility of *Mercury* owing to the circumstance that the planet is a considerable distance south of the